CLAIMS

1. An optical component comprising a combination of optical waveguide elements for modifying the spot size of a mode of an electromagnetic field propagated by an optical waveguide element, the optical waveguide elements being formed on a substrate, the optical component comprising a) a first section, comprising a first optical waveguide element adapted to sustain at least one mode of the electromagnetic field, b) a second section comprising at least two cooperating optical waveguide elements, each of said at least two cooperating optical waveguide elements comprising at least one waveguide segment, said at least two cooperating optical waveguide elements being optically connected to said first optical waveguide element of said first section; wherein said cooperating optical waveguide elements of said second section are adapted to maintain optical coupling between said optical waveguide elements to ensure that said at least one mode of the electromagnetic field is sustained by said at least two cooperating optical waveguide elements in cooperation.

2. An optical component as claimed in claim 1 wherein said substrate defining a reference plane, the optical waveguide elements having width dimensions defined in the reference plane and in a cross section of the optical waveguide elements perpendicular to the intended direction of propagation of the electromagnetic field of the optical waveguide elements, and said first optical waveguide element of said first section having a width w_1 is tapered so that its width w_1 increases towards its connection to said cooperating optical waveguide elements of said second section.

3. An optical component as claimed in claim 2 wherein the tapering of said first optical waveguide element of said first section is arranged by at least one of the edges of the waveguide element in a direction substantially parallel to the direction of propagation of the electromagnetic field of said first optical waveguide element being defined by a generating curve essentially following a cosine path or an n^{th} order polynomial path, such as a linear path or a 5^{th} or a 7^{th} order polynomial path.

4. An optical component as claimed in claim 2 or 3 wherein the tapering of said first optical waveguide element of said first section is defined by a generating curve essentially following a cosine path or an n^{th} order polynomial path, such as a linear path or a 5^{th} or a 7^{th} order polynomial path.

5. An optical component as claimed in any one of the preceding claims wherein adjacent of said at least two cooperating optical waveguide elements of said second section have mutual edge to edge core distances $s_{2,i,i+1}$, and wherein said edge to edge core distances $s_{2,i,i+1}$ decrease towards their connection to said first optical waveguide element of said first section.

6. An optical component as claimed in claim 5 wherein said cooperating optical waveguide elements of said second section having core widths $w_{2,i}$ are tapered so that their widths $w_{2,i}$ increase towards their connection to said first optical waveguide element of said first section.

7. An optical component as claimed in claim 6 wherein the tapering of said cooperating optical waveguide elements of said second section is arranged by at least one of the edges of said waveguide elements in a direction substantially parallel to the direction of propagation of the electromagnetic field of said first optical waveguide element being defined by a generating curve essentially following a cosine path or an n^{th} order polynomial path, such as a linear path or a 5^{th} or 7^{th} order polynomial path.

8. An optical component as claimed in claim 6 or 7 wherein the tapering of at least one of said cooperating optical waveguide elements of said second section is defined by a generating curve essentially following a cosine path or an n^{th} order polynomial path, such as a linear path or a 5^{th} or a 7^{th} order polynomial path.

9. An optical component as claimed in any one of the preceding claims wherein the width w_1 of said first optical waveguide element of said first section is larger than or equal to the sum of widths $w_{2,i}$ of said cooperating optical waveguide elements of said second section at their mutual connection.

10. An optical component as claimed in any one of the preceding claims wherein said at least two cooperating optical waveguide elements of said second section are adapted to be optically coupled to an output optical waveguide.

11. An optical component as claimed in claim 10 wherein said output optical waveguide is formed on said substrate.

12. An optical component as claimed in any one of the preceding claims, the optical component further comprising c) a third section comprising at least two dicing optical waveguide elements having core widths $w_{3,i}$, said at least two dicing optical waveguide elements being optically connected to said at least two cooperating optical waveguide elements of said second section.

13. An optical component as claimed in claim 12 wherein said at least two dicing optical waveguide elements are essentially straight and parallel.

14. An optical component as claimed in claim 13 wherein the widths $w_{3,i}$ of said at least two dicing optical waveguide elements of said third section remain essentially constant.

15. An optical component as claimed in any one of claims 12-14 wherein the widths $w_{2,i}$ of said at least two cooperating waveguides of said second section essentially equals the widths $w_{3,i}$, where i=1, 2, ..., of said at least two dicing optical waveguide elements of said third section at their mutual connection.

16. An optical component as claimed in any one of claims 12-15 wherein said at least two dicing optical waveguide elements of said third section are adapted to be optically coupled to an output optical waveguide.

17. An optical component as claimed in claim 16 wherein said output optical waveguide is an optical fibre, such as a single mode fibre, e.g. an SMF-28 type optical fibre.

18. An optical component as claimed in any one of the preceding claims wherein said first optical waveguide element of said first section is adapted to be optically coupled to an input optical waveguide, said input optical waveguide having a width w_{in} which is essentially equal to the width w_1 of said first optical waveguide element at their mutual connection.

19. An optical component as claimed in claim 18 wherein said input optical waveguide is formed on said substrate.

20. An optical component as claimed in any one of the preceding claims wherein said combination of optical waveguide elements comprises a base layer formed on said substrate, the base layer having a refractive index n_{base}, a waveguide defining core pattern of a core material formed on the base layer, the core material having a refractive index n_{core}, an upper cladding layer covering the core pattern and the base layer, the upper cladding layer having a refractive index n_{uclad}.

21. An optical component as claimed in claim 20 wherein the index contrast between core and cladding and/or core and base layers $(n_{core}-n_{uclad})/n_{core}$, $(n_{core}-n_{base})/n_{core}$, respectively, is larger than 0,5 %, such as larger than 1%, such as larger than 2%

22. An optical component as claimed in any one of the preceding claims wherein at least one transversal waveguide core element is arranged between said at least two cooperating optical waveguide elements of said second section.

23. An optical component as claimed in claim 22 wherein a multitude of M transversal waveguide core elements each having a width $w_{t,j}$, where j=1, 2, ..., M, and forming paths with a mutual centre to centre distance of $s_{t,j,j+1}$, where j=1, 2, ..., M-1, j=1 corresponding to the transversal element located closest to said first section and j=M corresponding to the transversal element located farthest from said first section.

24. An optical component as claimed in claim 23 wherein said widths $w_{t,j}$ decrease with increasing j and/or said centre to centre distances of $s_{t,j,j+1}$ increase with increasing j.

25. An optical component as claimed in any one of the preceding claims wherein said core material comprises a material from the group GaAs, InP, SiON, Silicon, polymers, sol-gel glasses, $LiNbO_3$.

26. A method of manufacturing an optical component according to any one of claims 1-25, the method comprising the steps of
a) providing a substrate,
b) forming a lower cladding layer on the substrate,
c) forming a core layer on the lower cladding layer,
d) providing a core mask comprising a core region pattern corresponding to the layout of the core regions of optical waveguide elements of the component,
e) forming core regions using the core mask, a photolithographic and an etching process, and
f) forming an upper cladding layer to cover the core region pattern and the lower cladding layer,

27. A method according to claim 26, the method further comprising the steps of
g) cutting the dicing waveguides of the third section of the components
h) dicing/polishing the end facets of said dicing waveguides.

28. A method according to claim 26, the method in step d) further comprising the sub-step of
d1) providing that the tapering of the core region of said first waveguide element of said first section and/or at least one of said cooperating optical waveguide elements of said second section of said optical component is/are defined by a generating curve essentially following a cosine path or an n^{th} order polynomial path, such as a linear path or a 5^{th} or a 7^{th} order polynomial path.

29. A method according to claim any one of claims 26-28 wherein the substrate is a silicon substrate, the base and cladding layers comprise silica based oxides and the core layer comprises silicon-oxy-nitride.

30. A method as claimed in any one of claims 26-29 wherein the formation of layers on the substrate is made by plasma enhanced chemical vapour deposition.